Mechanical challenges of MAX IV

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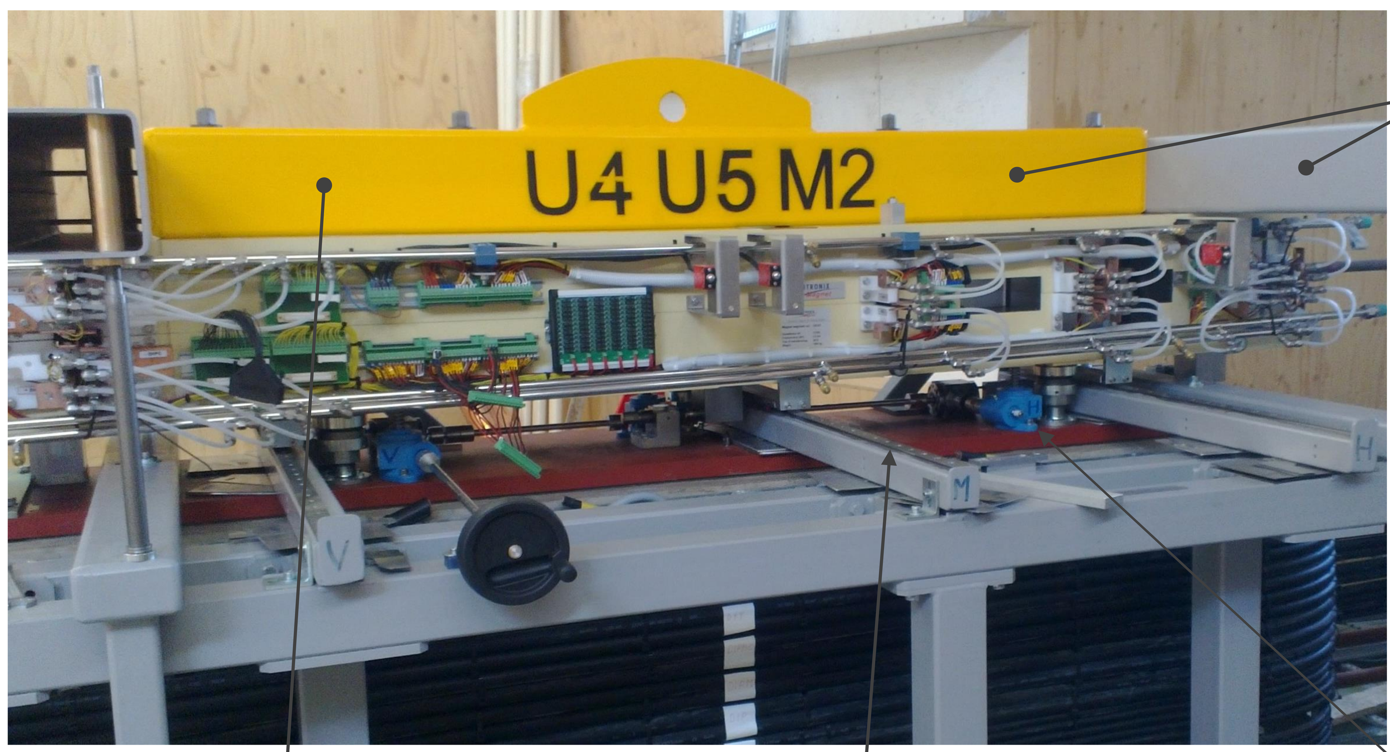
Service Table How to do maintenance on lower magnet block without breaking vacuum

If somehow a coil starts to leak water and it is positioned in the lower magnet block we will retract the lower magnet block while we are holding the upper block in position by a portal. Upper block will also keep the vacuum chamber in position by the BPM's connected to the upper block. Live tests have been conducted at our Mock Up with real a magnet block with success

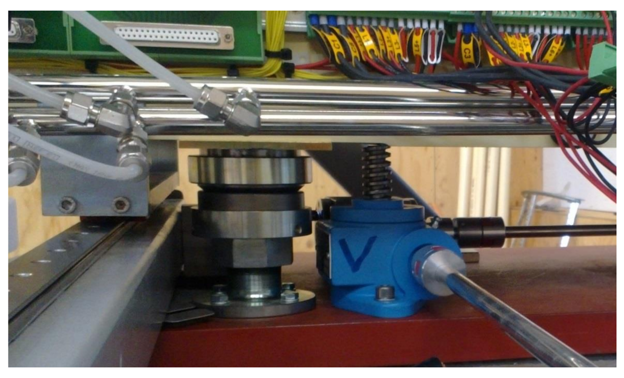


Portal supported by the floor and the magnet stand top plate. Connected with lifting yoke for rigidity

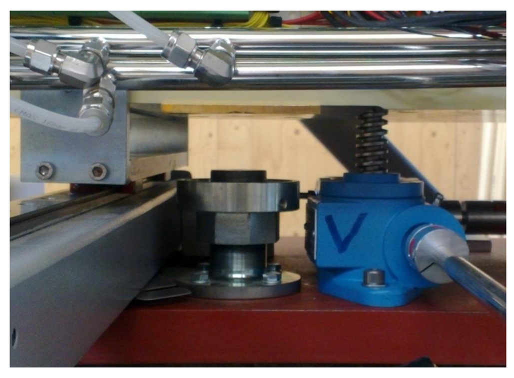
Lifting yoke to place the magnets, or for removal of upper block

Rail, 3x, to slide magnet block into position for maintenance

Jack, 3x, for lowering and lifting the lower magnet block to position

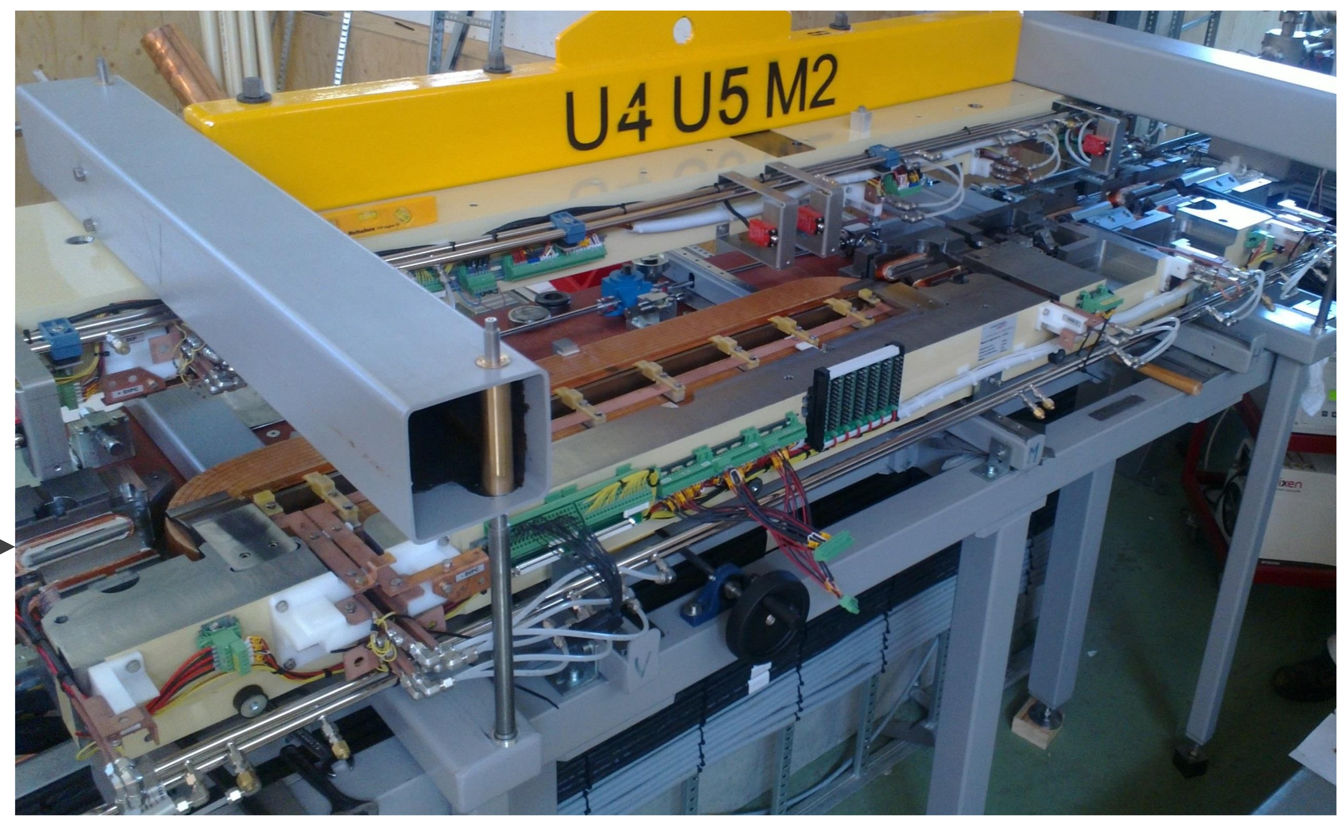


Jack in contact with lower block



Sliding puck and spherical bearing removed
The lower block is now supported by the jack

The portal keeps the upper block in position while the lower block is dismantled, still supported by adjustment screws. The jack lift 0,1-0,2 mm and release pressure on sliding puck. With puck and bearing removed we now lowering the lower magnet block. It ends up on the guided wagon. Now it's free to retract to maintenance position



Thin absorbers

Emittance light from the bending is used for the diagnostics. The mirror reflecting the light is to be protected from the heat. The thin absorber shields light at ~1mrad vertical.

Stopping power is around 500W and has spiral cooling channels

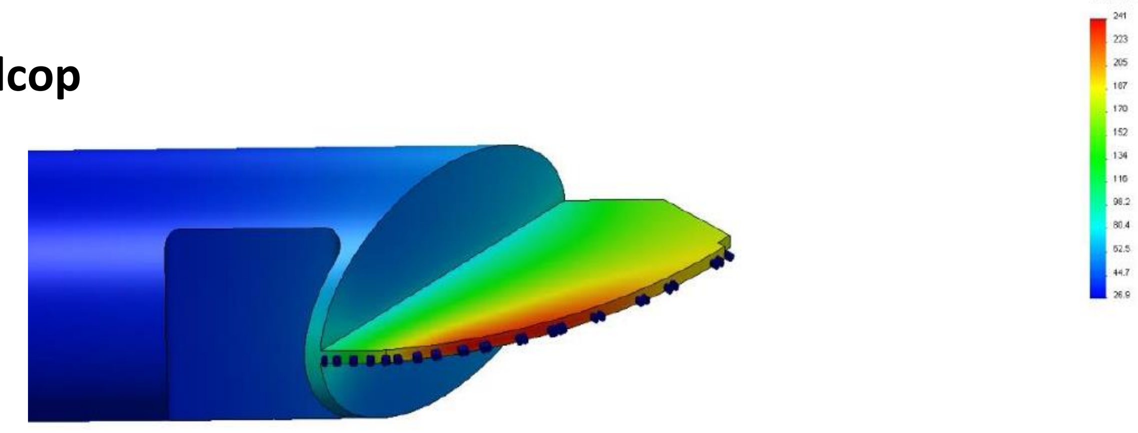
Design criteria for OFHC and Glidcop

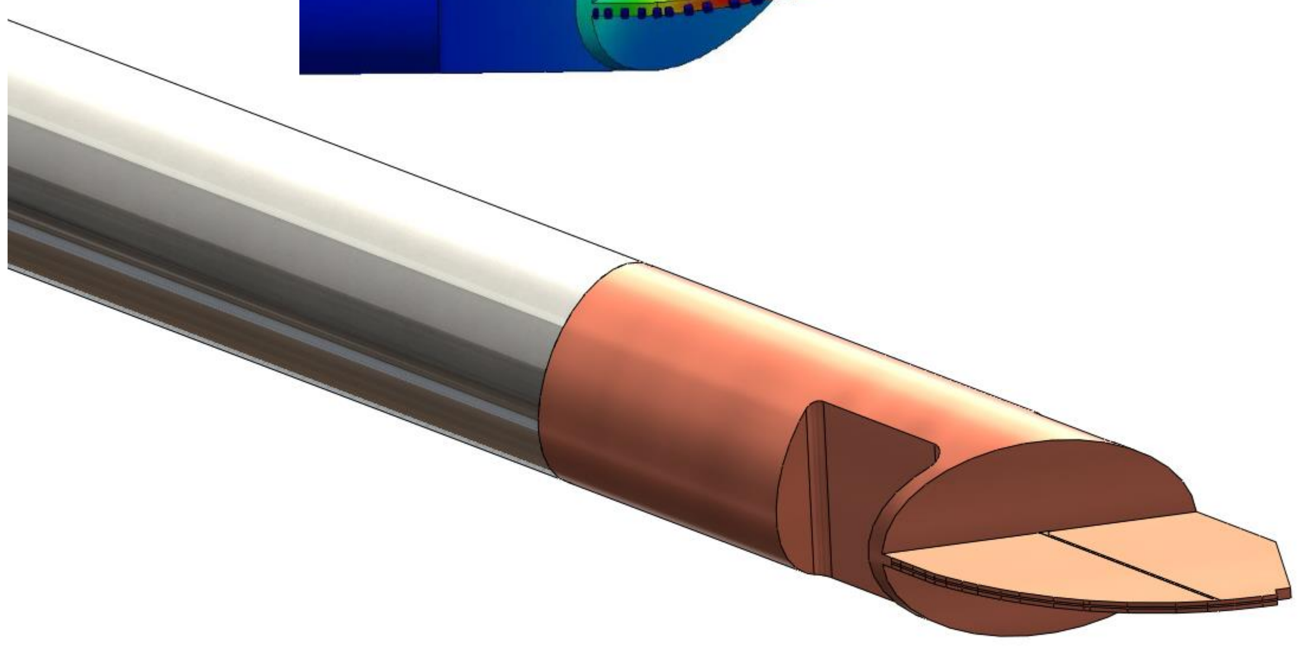
OFHC:

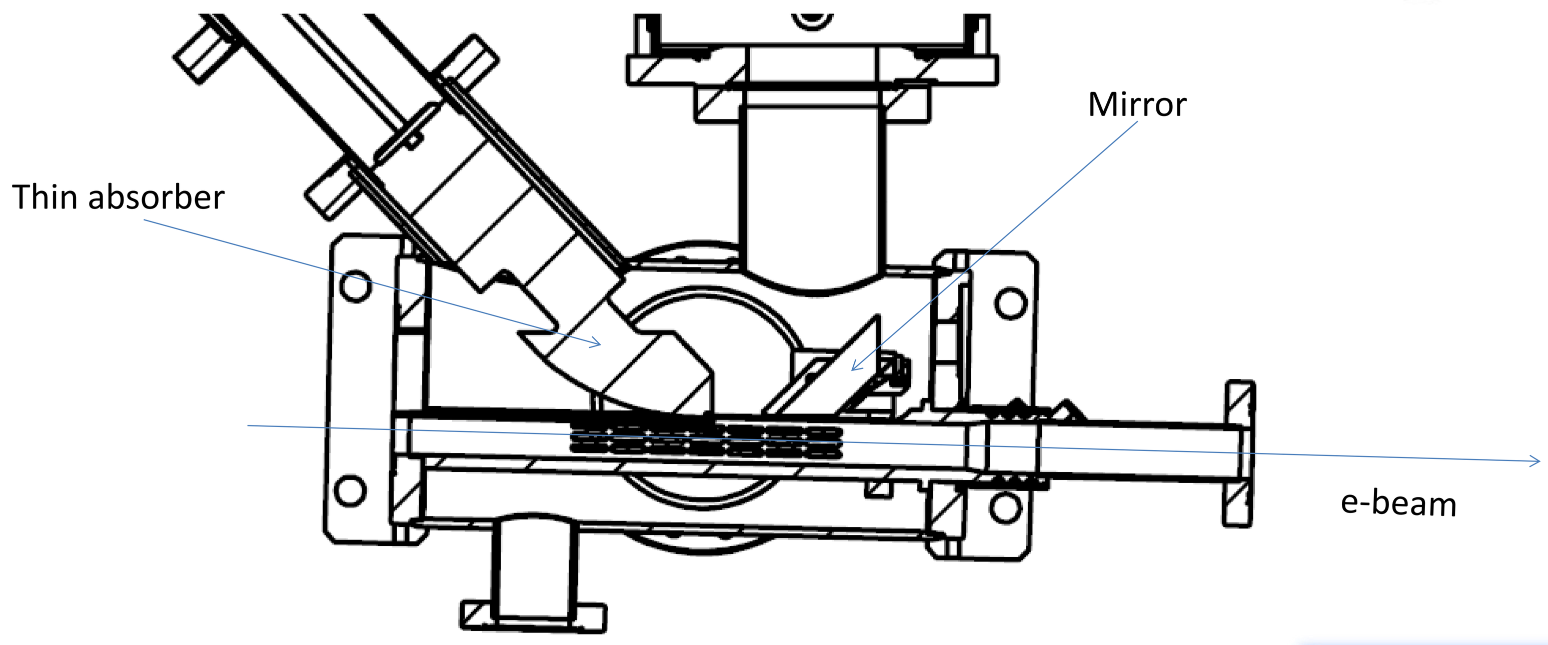
- Strain 0.1%
- 50MPa
- <Δ150°C

Glidcop:

- Strain 0.1%
- 150MPa
- <Δ300°C

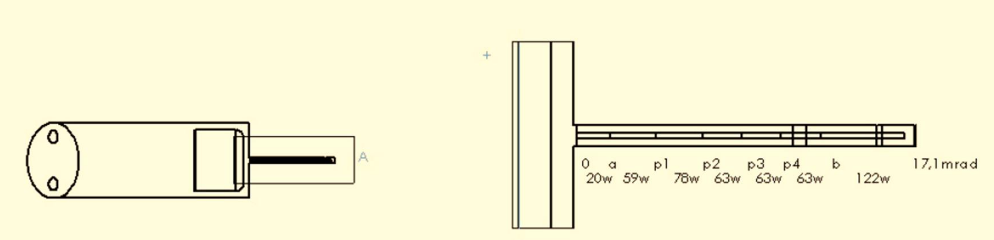


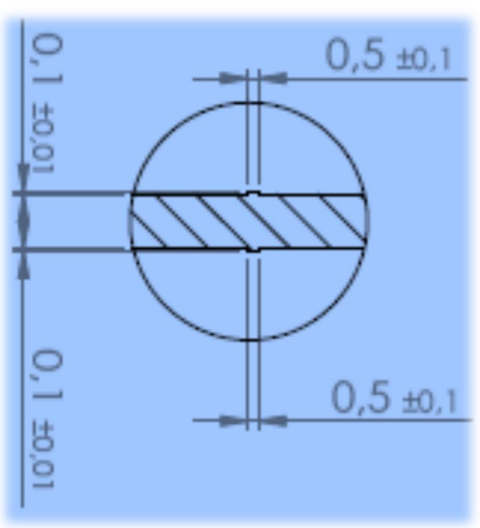




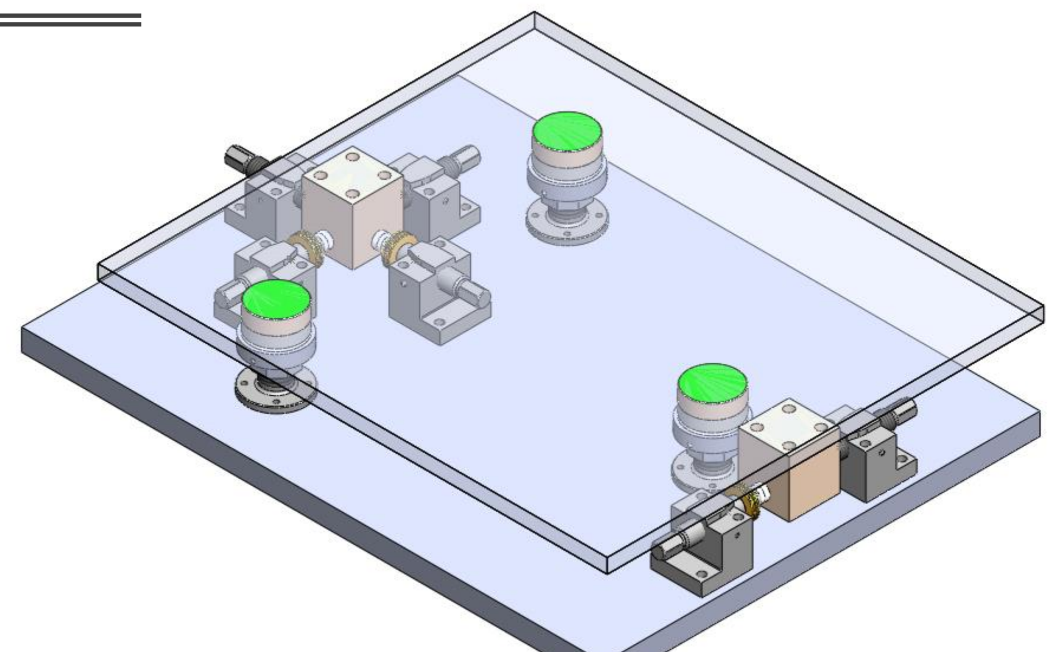
Heat load

	mm	mm	W		mrad	
0	-3,00	-5,33			0,00	
a	0,00	0,00	20,00	20,00	1,98	
p1	4,10	7,29	59,00	79,00	4,59	
p2	8,30	14,76	78,00	157,00	7,20	
p3	11,80	20,98	63,00	220,00	9,30	
p4	15,30	27,20	63,00	283,00	11,39	
b	18,90	33,60	63,00	346,00	13,49	0,00
	26,38	46,90	122,44	468,44	17,10	13,30
c	31,30	55,65	203,00	203,00	20,29	22,05





A small ridge at the center of the thin absorber allows up to 2.8mrad rotational error without reflecting any light



Alignment.

Important guidelines for alignment. One screw for each degree of freedom-

1. Horizontal sliding plane above height adjustment
2. Horizontal sliding as close to beam as possible
3. Three height adjustment units
4. One longitudinal adjustment screw with a spring loaded counter screw
5. Two screws for transversal adjustment, each with opposite spring loaded screw

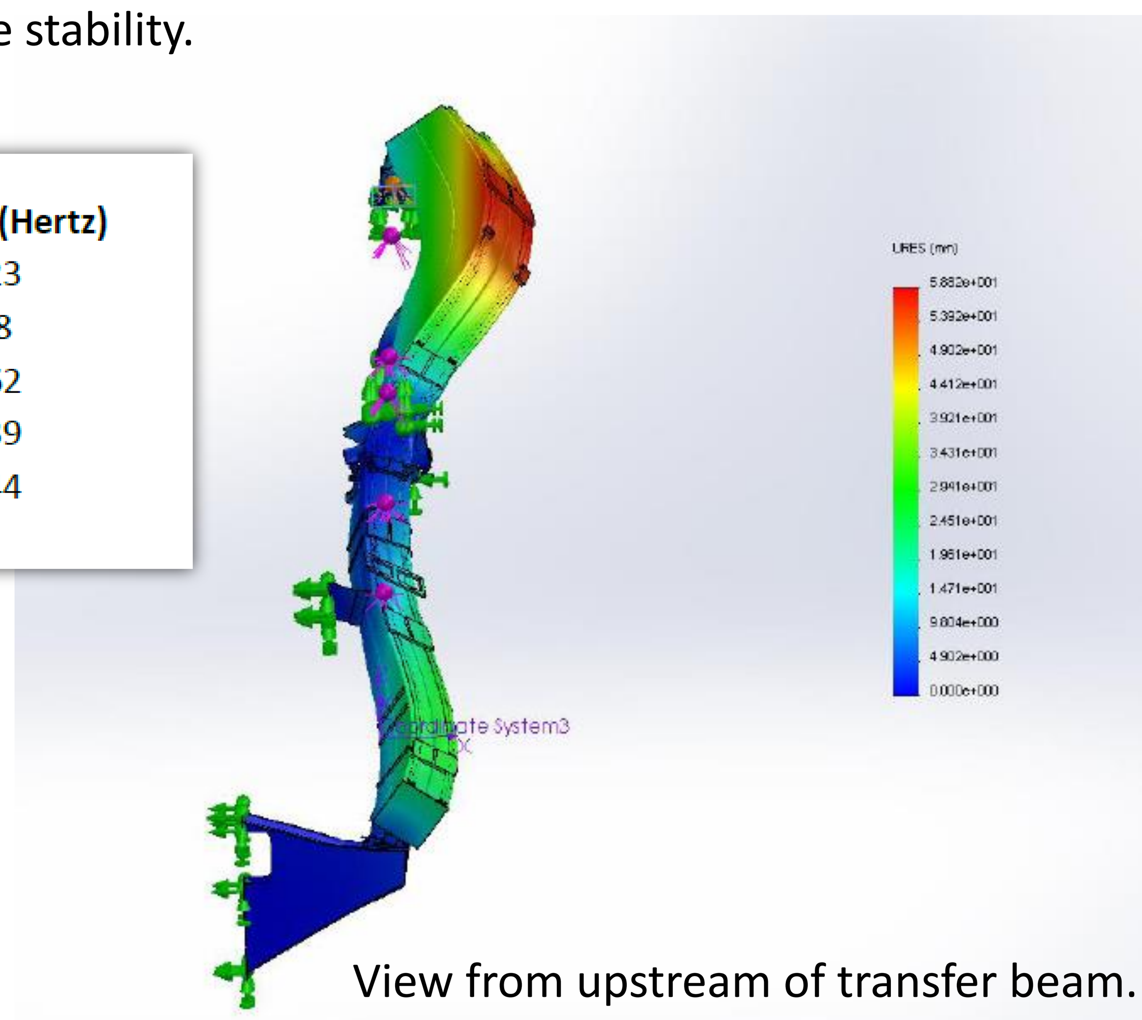
Stability

Natural frequency should be above 50Hz for all supports and parts of the MAX IV machine. Designing supports with stability in mind from the beginning makes it easier to achieve the goals.

The best and most simple rule is to work with triangles and the next step is to increase cross-sections.

FEA visualize weak structures and a video sequence of the first modes gives an idea of how to increase the stability.

Mode No.	Frequency(Hertz)
1	74.223
2	77.78
3	99.962
4	133.39
5	146.44



View from upstream of transfer beam. The beam needed support to stop rotational movement.